

Corpus Christi, Tex. 11th, Tribune, Kans. 12th, Salina, Kans. 13th, Salina and Tribune, Kans. 14th, Helena, Mont. 17th, Tribune, Kans.; Marquette, Nebr. 18th, Webster, Dak.; Marquette, Nebr. 20th, Salina, Kans.; Fairbury, Nebr. 23d, Marquette, Nebr. 27th, Webster, Dak.

SAND STORMS.

Fort Grant, Ariz., 15th; Willcox, Ariz., 17th, 28th, 29th. Fresno, Cal., 18th. Fort Mojave, Ariz., 18th, 27th; Yuma, Ariz., 19th, 20th. Las Vegas, N. Mex., 29th.

VERIFICATIONS.

INDICATIONS FOR 33 HOURS IN ADVANCE.

The percentages of verifications of the tri-daily indications for February, 1888, as determined from comparison of succeeding telegraphic reports, are given in the table below.

The predictions for all districts east of the Rocky Mountains for February, 1888, were made by 1st Lieutenant H. H. C. Dunwoody, 4th Artillery, U. S. Army, Acting Signal Officer and Assistant, except those for Minnesota and Dakota, which were made at Saint Paul, Minn., by 1st Lieutenant Thomas M. Woodruff, 5th Infantry, U. S. Army, Acting Signal Officer; those for the Pacific coast districts were made at San Francisco, Cal., by 2d Lieutenant J. E. Maxfield, Signal Corps; the verifications for all districts were determined by Junior Professor C. F. Marvin.

Percentages of indications verified, February, 1888.

States.		States.	
Maine.....	83.38	Kentucky.....	80.69
New Hampshire.....	84.00	Ohio.....	80.83
Vermont.....	77.66	West Virginia.....	80.66
Massachusetts.....	83.56	Indiana.....	82.66
Rhode Island.....	81.45	Illinois.....	80.34
Connecticut.....	86.24	Lower Michigan.....	80.69
Eastern New York.....	81.31	Upper Michigan.....	77.28
Western New York.....	79.72	Wisconsin.....	82.10
Eastern Pennsylvania.....	81.69	Minnesota*.....	73.97
Western Pennsylvania.....	82.17	Iowa.....	79.59
New Jersey.....	80.79	Kansas.....	84.69
Delaware.....	79.48	Nebraska.....	78.76
Maryland.....	82.93	Missouri.....	80.14
District of Columbia.....	82.10	Colorado.....	81.31
Virginia.....	78.21	Dakota*.....	70.93
North Carolina.....	81.03	Southern California*.....	82.03
South Carolina.....	79.59	Northern California*.....	81.48
Georgia.....	78.52	Oregon*.....	82.89
Eastern Florida.....	78.66	Washington Territory*.....	77.90
Western Florida.....	74.31	By elements:	
Alabama.....	75.10	Weather.....	83.58
Mississippi.....	79.13	Wind.....	77.48
Louisiana.....	78.86	Temperature.....	77.54
Texas.....	79.59		
Arkansas.....	78.83	General average.....	80.55
Tennessee.....	81.38		

* In determining the general average percentage for the different elements, Minnesota, Dakota, and the Pacific coast states have not been included.

CAUTIONARY SIGNALS.

Of the total number of cautionary and storm signals ordered during February, 1888, it was practicable to determine the justification or failure of twenty-eight; justified, twenty-five, or 89.29 per cent. Of the above, twelve were ordered for cautionary signals; number justified, ten, or 83.33 per cent. Sixteen storm signals were ordered; justified, fifteen, or 93.75 per cent. Total number of direction signals ordered, twenty-seven, all, or 100 per cent., of which were justified, five signals being ordered for easterly winds, and twenty-two for westerly winds. Number of storms without signals, thirteen.

STATE WEATHER SERVICES.

The following extracts are republished from reports for February, 1888, of the directors of the various state weather services:

The "Alabama Weather Service," P. H. Mell, jr., of the Agricultural and Mechanical College, Auburn, director:

The month had no special features to distinguish it from Februarys of previous years. Only two cold waves passed over the state, and they were not severe. The average temperature was 2°.4 above the normal. In some portions of the state considerable rain fell, but yet the average was about normal.

The winter has been quite mild, and but few days occurred that were really cold and disagreeable. Rainy days, however, were frequent. The warm days

towards the latter part of the winter brought forth the early buds on the fruit trees and in the forests, but many of the tender germs were destroyed by the cold wave that passed over the state on the 26th of February. There is, however, a good prospect for a fair yield of fruit, because many of the buds were not far enough advanced to be materially affected by the cold snap.

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 51.6; highest monthly mean, 66.1, at Newton; lowest monthly mean, 38.8, at Chattanooga; maxi-

Number of signals ordered late, *i. e.*, after the justifying velocity had begun, eight, or 28.57 per cent.

COLD-WAVE SIGNALS.

Total number of cold-wave signals ordered from Office Chief Signal Officer, one hundred and eighty; justified, one hundred and fifty-five, or 86.11 per cent. One hundred and eighteen cold-wave signals were ordered during the month by the Signal Service Officer at Saint Paul, Minn., of which, ninety-eight, or 83.05 per cent., were justified.

LOCAL VERIFICATIONS.

The following extracts from the published reports of the several state weather services for February, 1888, show the percentages of verification of weather and temperature signals for the various states:

Indiana.—La Grange: the indications received during February were the best and most correct since they have been sent here; 100 per cent. for state of weather and 97 per cent. for temperature were verified.

Seymour: The indications are growing in favor with the people; 87 per cent. were verified.

Michigan.—Weather and temperature signals are now displayed in one hundred and forty-three towns in the state, and on the baggage-cars of twenty-six trains on eight principal railroads of the state.

The indications and cold-warnings are issued by the Chief Signal Officer and distributed to the different stations through the central office. The indications are issued at 1 a. m., daily, from the Chief Signal Office, Washington, and are for the twenty-four hours from 7 a. m. to 7 a. m.

The percentage of verification of these indications for February is as follows (the verification is taken from reports of displaymen furnished this office monthly): weather, 84.8 per cent.; temperature, 81.6 per cent.

The percentage of verification of weather predictions for February on the D., G. H., and M. R'y., is 87.0 for weather, and 81.3 for temperature; on the C. & G. T. R'y., weather, 86.7, and temperature, 88.0; P. H. & N. W. R'y., weather, 90.0, and temperature, 87.0; M. C. R'y., for weather, 88.3, and for temperature, 87.0; G. R. & I. R'y., weather, 83.8, and temperature, 85.0; C. & W. M. R'y., weather, 85.0, and temperature, 88.3; P. O. & P. A. R'y., weather, 90.0, and temperature, 87.0.

Minnesota.—The percentage of verification of weather signals was 80 for weather, and 76 for temperature.

Nebraska.—The percentages of correct predictions for the state are as follows: temperature, 86.2; weather, 83.3; mean, 84.8.

Nevada.—The display of signals at Carson City, which has been done regularly since October 4, 1887, has given great satisfaction to the citizens of that place and vicinity, and so generally have the indications been verified that there is reason to hope that they will be of great benefit to the interests of Nevada.

Oregon.—The weather indications displayed at Albany, Salem, and Roseburg, were verified as to weather 78 per cent., as to temperature 77 per cent. These indications are telegraphed at 2 p. m. daily from San Francisco, and are for the twenty-four hours commencing at 7 p. m. date of receipt of telegram.

South Carolina.—The percentages of verifications of the weather and temperature predictions for the whole state was: for weather, 86.8; for temperature, 90.1.

Tennessee.—The percentage of verification of the daily weather and temperature predictions, issued from the Signal Office at Washington to the various stations were, for the state: weather, 88.9 per cent.; temperature, 88.8 per cent.

imum, 79, at Newton, on 11th; minimum, 9, at Gadsden, on the 24th; range for state, 70; greatest local monthly range, 59, at Valley Head; least local monthly range, 48, at Union Springs.

Precipitation, including melted snow (in inches).—Average for the state, 4.94; greatest, 10.88, at Mobile; least, 2.90, at Carrollton.

The "Arkansas Weather Service," report prepared by W. U. Simons, Signal Corps, Little Rock:

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 44.2; highest monthly mean, 47.2, at Washington; lowest monthly mean, 39.0, at Conway; maximum, 76, at Little Rock, on 19th; minimum, 7, at Eureka Springs, on the 27th; range for state, 68; greatest local monthly range, 68, at Eureka and Fort Smith; least monthly range, 46, at Washington.

Precipitation, including melted snow (in inches).—Average for the state, 2.88; greatest, 5.25, at Portia; least, 0.60, at Heba.

The "Colorado Weather Service," Prof. F. H. Loud, Colorado Springs, director:

Summary.

Temperature (in degrees Fahr.).—Mean for state (nineteen stations reporting), 29.2; highest monthly mean, 41.2, at Canon City; lowest monthly mean, 15.8, at Climax; maximum, 70, at Greeley, on 12th and 28th; minimum, -6, at Alma, on 5th; monthly range for state, 76; greatest local monthly range, 70, at Pandora; least local monthly range, 38, at Georgetown.

Precipitation, including melted snow (in inches).—Average for state (ten stations reporting), 0.50; greatest, 1.29, at Walden; least, 0.15, at Husted.

The "Monthly Review of the Illinois Weather Service," Col. Charles F. Mills, Springfield, director:

The temperature was below the average in all divisions of the state, 8° below in the northern, 2° in the central, 2° in the southern, and in the whole state 2° below the average of the past ten years. The lowest temperature, -28°, was only once exceeded during the last ten years, in 1885, when it reached -32°. Only twice during the same period has the mean temperature been lower, in 1881, when it was 24.5, and 1885, when it was only 18.7. The highest mean temperature in ten years was 39° 5', in 1882, and the lowest was 18° 7', 1885, showing the large range of 20° 8'. The mean of the past February, 27° 1', was 8° 4' above the lowest, and 12° 4' below the highest. The coldest days were the 9th and 24th, and the warmest were the 18th and 19th.

The rainfall was also greatly below the average of the past ten years, 1.48 inches for the state, 1.32 for the northern, 1.11 for the central, and 2.02 for the southern division. The total mean for the month was 1.96 inches, more than the half of which fell on the 24th. The snowfall was light, only 8 inches for the average of the state.

The "Indiana Weather Service," Prof. H. A. Huston, of Purdue University, Lafayette, director:

The barometric pressure over Indiana during the month of February was near the normal. An exceedingly high area of pressure passed over the state on the 15th, when the readings of the barometer were the highest for many years. The centres of low areas passed distant from the state, except on the 19th and 24th, very low depressions passing near caused thunder-storms over all parts; most violent, accompanied by hail and dangerous winds, in southwest portion. Sudden fluctuations occurred on the 4th, 7th, 9th, 15th, 19th, 21st, 24th, 27th, and 29th.

The monthly mean temperature was above normal in the east and south-east portions, and slightly below in the remainder of the state. The lowest readings were noted on the 9th in the central and northern portions of the state, when the temperature read below zero, and in the southern portion on the 27th the temperature remaining above. The highest readings were noted from the 18th to the 24th. Sudden changes occurred on the 6th, 9th, 25th, 26th, and 29th.

The precipitation was over two inches below the normal in all parts of the state, except in the northern portion, where the deficiency was slightly less. The amount of snowfall was slight only; several observers reported none at all.

Except in the extreme southern part of the state the observers report wheat and pasturage in a bad condition, caused by the deficiency of rainfall preceding the winter months, insufficient snowfall to protect the crops from continuous cold during the winter, and during February warmer rains followed suddenly by hard freezing weather.

The "Kansas Weather Service," Prof. J. T. Lovewell, Topeka, director:

Summary.

Atmospheric pressure (in inches).—Monthly mean, 30.08; maximum, 30.94, at Lebo, on the 15th; minimum, 29.48, at Wilson, on the 18th; range for state, 1.61; greatest local range, 1.40, at Lebo; least local range, 1.17, at Halstead.

Temperature (in degrees Fahr.).—Monthly mean, 37; highest monthly mean, 46, at Dorrance; lowest monthly mean, 31, at Cawker City and Leavenworth; maximum, 82, at Collyer, on the 20th; minimum, -8, at Concordia, on the 9th; range for state, 91; greatest local monthly range, 82, at Collyer; least local monthly range, 50, at Monument; greatest daily range, 50, at Gibson, on the 8th; least daily range, 2, on the 9th, at Rome and Sedan.

Precipitation, including melted snow (in inches).—Average for the state, 1.05; greatest, 2.30, at McAllister; least, 0, at Bunker Hill.

Wind.—Prevailing direction, south.

The "Louisiana State Weather Service," in charge of R. E. Kerkam, Sergeant, Signal Corps, at New Orleans:

The mean temperature of the past month for the state, 56° 0', was 1° 6' above the February normal of the past eighteen years, in which period there were but two Februarys (1882 and 1887) that were noticeably warmer. The coldest February during that period was in 1885, when the mean temperature was 7° 5' below that of the past month. The mean temperature of the northern division was 52° 9', and of the southern division, 58° 6'. The highest temperature reported, 79°, occurred at Abbeville, on the 8th, and the lowest, 28°, at Delta, on the 28th, making the absolute range of temperature for the state 51°. The mean daily range of temperature was 14° 4', the highest local mean daily range, 16° 5', being reported from Shreveport, and the lowest, 11° 0', from Monroe. The mean maximum temperature for the state for the month was 68° 4', and the mean minimum, 48° 3'.

The average rainfall for the northern division was 3.54 inches, which was a deficiency of one and three-fourths inches in comparison with the eighteen years' normal for that section. The average rainfall for the southern division, 6.88 inches, was an excess of 2.85 inches in comparison with the eighteen years' normal for that section, and the average for the state for the month, 5.54 inches, was 0.81 of an inch above the February normal for the state. The heaviest monthly rainfalls reported were 11.68 inches, at Donaldsonville, 11.21 inches, at New Orleans, and 9.02 inches, at Mandeville. The heaviest daily rainfalls in the southern division ranged from 2.80 at Abbeville to 5.10 inches at Donaldsonville, occurring during the general thunder-storm of the 22d and 23d.

No snow fell during the month, and but an inappreciable quantity of sleet, at Farmerville.

The "Michigan Weather Service," N. B. Conger, Sergeant, Signal Corps, Lansing, director:

Temperature (in degrees Fahr.).—The temperature was below the normal in all sections during February. The greatest departure from the normal was in the upper peninsula, where it reached 7.1. The least in the northern section, where it reached 2.2 below the normal. The highest temperature during the month, 52, occurred at Bell Branch and Omer on the 17th. The lowest temperature, -36, occurred at Sault Ste. Marie on the 9th. The highest mean daily temperature for the month, 35, occurred on the 18th, when the temperature was 11 above the normal, and the lowest mean daily temperature, -10, occurred on the 9th, when the temperature was 33 below the normal. Comparing the mean daily temperatures of this month with the record of thirteen years, the highest temperature, 49, occurred on the 12th, 1882, and the lowest temperature -10, occurred on the 9th, 1888. The highest mean monthly temperature, 33.4, occurred in 1882, and the lowest mean monthly temperature, 10.2, occurred in 1885. Forty-two stations report a minimum temperature of -15, or lower, during the month, occurring on the 9th or 10th of the month. All stations of the upper peninsula and northern section report minimum temperatures of -20, or lower, during the month. The most severe cold wave of the month passed over the state on the 9th and 10th, when temperatures from -10 to -36 were reported.

Precipitation (in inches).—The average amount of precipitation for February, 1.88, is 0.92 below the normal of thirteen years. The precipitation was 0.27 above the normal in the upper peninsula, and below the normal from 0.61 in the northern section, to 1.30 below the normal in the southern section. Comparing the average precipitation of this month with the records of the past thirteen years it is found that the greatest average precipitation, 4.69, occurred in 1881, and the least, 0.05, occurred in 1877. This last record is the smallest monthly precipitation for any month that the records of this office show, there being but an average of two days on which 0.01 inch or more precipitation was recorded. There is but very little snow on the ground at the end of the month in the central and southern sections, mostly in drifts, leaving the fields bare. The northern section and upper peninsula have from 3 to 56 inches of snow on the ground at different stations. The average amount of snowfall on the level during the month is 8.2.

The "Minnesota Weather Service," Prof. W. W. Payne, Northfield, director:

The month was marked by a deficiency of precipitation and an abnormally low temperature. As is usual for a winter month in Minnesota the precipitation was comparatively small, yet the snow drifted badly on the 26th, so that trains from the west were delayed several hours. Logging operations proceeded uninterruptedly during the month and conditions were generally favorable for a full cut.

Temperature (in degrees Fahr.).—The average for the state, 9, is 4.1 colder than that of the corresponding month of 1886, and 2.3 warmer than that of 1887. In the southern portion of the state the temperature was from 4 to 5 below the normal of fifteen years, while there is a gradual decrease in the departure until the northern boundary is reached, where it was only 1 below the normal. The lowest monthly mean was -0.1, reported from Saint Vincent; the highest mean was 15.6, reported from La Crosse. The warmer portions of the month were: 1st to 3d, 13th, 16th to 19th, 22d to 24th. The maximum for the state, 50, reported on the 16th from Duluth; the next highest, 48, on the 18th, at La Crosse. The coldest periods of the month were: 7th to 10th (inclusive), 14th, 15th, 26th, 27th; on these days the mean daily temperature over the entire state was generally below zero. The minimum for the month occurred during the passage of the cold wave in the first of these periods. The lowest registered was -50, on the 9th, at Rush City, while on

the same day at Saint Vincent it was -49.9 ; Pine River Dam, -48 ; Moorhead, -47 ; Princeton, -44 ; Alexandria, -43.5 ; Glenwood and Morris, -40 . The greatest monthly range for any station was 95, at Pine River Dam; the range for the state was 100.

Precipitation, including melted snow (in inches).—This was fairly well distributed and mainly in the form of snow. The average for the state is 0.48; this is respectively 0.17 and 0.66 below the amounts of the corresponding months of the two preceding years. The greatest deficiency was in the vicinity of Lake Superior, where it was over three-quarters of an inch below the average. In the southern counties the deficiency amounted to half an inch, while in the northern counties it was only a quarter of an inch. Precipitation was general throughout the state on the 3d to 7th, 10th to 13th, 19th, 20th, 22d, 24th, 25th. The heaviest fall occurred during the prevalence of the storm on the 19th and 20th. The greatest total monthly precipitation was 0.91, at Mankato and Red Wing, while some of the smallest amounts were Morris, 0.11; Glenwood, 0.14; Saint Vincent, 0.22; Duluth, 0.24. At the close of the month from 3 to 10 inches of snow remained on the ground in the northern portion of the state, while elsewhere there was from 10 to 20 inches. The average number of cloudy days for the month was 9.4.

The "Mississippi Weather Service," Prof. R. B. Fulton, of the University of Mississippi, Oxford, director:

Reports were received this month from seventeen stations.

The monthly mean temperature, 51° , is 7° below the average for this month last year. The highest temperature for the month occurred on the 1st, 14th, and 19th, and the lowest occurred at all stations on the 28th.

The average rainfall for this month, 5.23 inches, is 0.25 inch in excess of the average for February, 1887, and was well distributed. The rainfall in the southern portion of the state was very heavy, while that in the northern portion was light, ranging from 8.90 inches at Biloxi, to 2.87 inches at University.

The "Missouri Weather Service," Prof. Francis E. Nipher, of Washington University, Saint Louis, director:

The average temperature for February was $32^{\circ}.8$. The highest reported was 78° , at Pro Tem and Sedalia, on the 18th, and the lowest, $-1^{\circ}.4$, at Kirksville, on the 9th. The average of maximum temperatures was $62^{\circ}.6$, and the average of minimum temperatures, $-2^{\circ}.7$, making an average monthly range of $65^{\circ}.3$.

The average precipitation was 2.06 inches, which was 0.76 inch below the normal for February. The greatest amount reported was 3.16 inches at Louisiana, and the least was 0.61 inch at Ozark. The precipitation was most abundant in the eastern portion of the state. The least rain and snow fell in the north and southwest sections. The precipitation was, however, fairly distributed over the state.

At the central station (Saint Louis) the mean temperature was $33^{\circ}.6$, which was slightly below the normal. The highest temperature was $60^{\circ}.8$, and the lowest $2^{\circ}.7$, making a range of $58^{\circ}.1$ for the month. The average daily range was $11^{\circ}.1$. The total precipitation was 2.91 inches.

The "Nebraska Weather Service," Prof. Goodwin D. Swezey, of Doane College, Crete, director:

The month has been the coldest February for many years, although the extremes of cold have not been great and there have been some unusually warm days; the precipitation and the number of rainy days have been almost exactly normal. The mean temperature of the state has been $10^{\circ}.2$, which is colder than any February and colder even than any January but one for the past eleven years. Yet the minimum for the month was only $-19^{\circ}.4$, while it usually falls to -20° and -25° . Indeed, there has been but one February with a minimum as high, and no February with so high a maximum temperature for the past eight years.

A narrow strip along the Missouri River, from the Platte southward, together with the western part of the state, received over an inch of precipitation, reaching nearly two inches in the southeastern corner of the state; the rest of the state has received less than an inch, and the northeastern, central, and extreme southern portions have received less than half an inch; the average for the state is about three quarters of an inch.

The "Nevada Weather Service," Prof. Charles W. Friend, Carson City, director:

Both pressure and temperature were above the normal for this month throughout all parts of the state from which reports are received. The highest temperature reported, $75^{\circ}.9$, occurred at Reno, on the 28th, and the lowest, 4° , occurred at Elko and Fly, on the 6th. In the western part of the state the lowest temperature occurred on the 29th, and in the eastern part, on the 6th. Throughout the whole state the highest temperatures occurred from the 26th to the 28th.

The weather has been generally clear, the winds light, the prevailing direction being southwest to northwest, and the rainfall not generally above half the average for this month. The rainfall was heaviest in the southeastern part of state, Pioche reporting 3.16 inches. Throughout the greater part of the state it was less than half an inch. There was generally little snowfall, but Pioche reports a snowfall that measured one foot in depth.

The "New England Meteorological Society," Prof. Wm. H.

Niles, of the Institute of Technology, Boston, Massachusetts, president:

Atmospheric pressure (in inches).—Monthly mean, 30.06 (thirteen stations); maximum observed, 30.60, at New Haven, Conn., on the 16th; minimum observed, 29.36, at Eastport, Me., on the 8th; range for New England, 1.24; greatest local monthly range, 1.16, at Eastport, Me.; least local monthly range, 0.88, at Nantucket, Mass.

Temperature (in degrees Fahr.).—Monthly mean, 23.9 (one hundred stations); highest monthly mean, 30.8, at Nantucket; lowest monthly mean, 14.5, at Berlin Mills, N. H.; maximum, 60, at Olneyville, R. I., on the 14th; minimum, -30 , at Woodstock, Vt., on the 10th; range for New England, 90; greatest local monthly range, 81, at Woodstock, Vt.; least local monthly range, 47, at Nantucket, Mass.; greatest daily range, 62, at Berlin Mills, N. H., on the 15th; least daily range, 0, at Walpole, on the 15th.

Precipitation, including melted snow (in inches).—Average for New England, 3.78 (one hundred and twenty stations); greatest, 6.11, at Orono, Me.; least, 0.79, at Burlington, Vt.

Wind.—Prevailing direction, northwest (thirteen stations).

The "New Jersey Weather Service," Prof. George H. Cook, of the Agricultural College, New Brunswick, director:

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 30.6; highest monthly mean, 34.0, at Ocean City; lowest monthly mean, 27.1, at Hanover; maximum, 60.0, at Trenton, on the 20th; minimum, -5 , at Tenaflly, on the 16th; range for the state, 65.0; greatest local monthly range, 69.0, at Tenaflly; least local monthly range, 48.0, at South Orange; greatest daily range, 48.0, at Tenaflly, on the 2d; least, 3.0, at Newark, Beverly, and Clayton, on the 6th, 7th, and 12th, respectively.

Precipitation, including melted snow (in inches).—Average for the state, 5.53; greatest, 6.01, at Tenaflly; least, 2.04, at Toms River.

Humidity.—Mean relative humidity for the state, 76.5 per cent.

Wind.—Prevailing direction, northwest.

Thunder-storms.—At nearly all stations on the 20th.

The "North Carolina Weather Service," Dr. Herbert Battle, of Raleigh, director:

Summary.

Temperature (in degrees Fahr.).—Monthly mean, 45.4; maximum, 78, at Salem, on the 18th, and at Weldon on the 20th; minimum, 9, at Knoxville, Tenn., on the 28th; range for the state, 64; average monthly range for the state, 54.3.

Precipitation, including melted snow (in inches).—Average for the state, 4.29; greatest, 6.42, at Salem; least, 2.41, at Norfolk, Va.

Wind.—Prevailing direction, northeast.

The "Ohio Meteorological Bureau," Prof. B. F. Thomas, of the Ohio State University, Columbus, president; Charles E. Kilbourne, Secretary:

The mean atmospheric pressure, 30.09 inches, is 0.39 inch below the mean for the past six years. The highest barometer, 30.92 inches, at Wauseon, on the 15th, is the highest record for the month of February. The lowest barometer was 29.22 inches, at Toledo, on the 25th.

The mean temperature, $30^{\circ}.5$, is $0^{\circ}.8$ above the six-year average. The highest temperature, $68^{\circ}.5$, occurred at Portsmouth on the 18th, and the lowest, $9^{\circ}.8$ below zero, at Hiram, on the 10th. The mean daily range of temperature was $17^{\circ}.8$. The greatest daily range, 40° , occurred at Youngstown on the 14th, and the least, 3° , at Sidney, on the 1st and 20th; Greenville on the 1st, and at Celina on the 1st and 4th. The mean relative humidity was slightly below the normal.

Precipitation was general throughout the state on the 4th, 5th, 14th, 19th, 20th, 24th, and 25th, and light rains or snows occurred in all sections on the 7th, 26th, 27th, and 29th; in the northern section on the 15th, and in the southern on the 9th, 11th, and 12th. Snow was reported from stations in all sections on the 5th, 7th, 15th, 25th, 26th, and 27th; from the middle section on the 1st, and in the southern section on the 4th, 8th, 9th, 14th, and 28th. The mean rainfall for the state, 1.74 inches, is 2.12 inches below the average for the past six years. The rainfall for January was 0.02 inch above the average, leaving a deficiency since the 1st of January of 2.10 inches. The greatest monthly rainfall was 2.94 inches, at Hanging Rock, and the least, 0.75 inch, at Toledo. The greatest daily rainfall, 1.09 inches, occurred at Quaker City, on the 25th. Cold-wave signals were ordered from Washington on the 7th, 9th, 14th, and 25th, for the state, and for stations in the northern part of the state on the 21st. These were all justified by cold waves on the 8th and 9th, 15th and 16th, 21st and 22d, 26th and 27th. The cold wave of the 21st extended to all parts of the state. A slight cold wave occurred in the northern section on the 6th.

"Oregon Weather Service," report prepared by B. S. Pague, Sergeant, Signal Corps, Roseburg, Oregon:

This report closes the first year of the "Oregon Weather Service," conducted by private individuals, and it is hoped that by the close of another year the service will have a legal existence by the authority of the state.

The month has been marked by an absence of violent storms, unusually high temperature, and scant rainfall, and great number of warm, clear, or fair days. The weather was very favorable for both the agriculturist and horticulturist.

Temperature (in degrees Fahr.).—The mean temperature for the month was higher than the normal temperature for February in all sections of the state, ranging from 6 above the normal at Newport to a normal temperature at Bandon; both places being on the immediate coast. In the interior region it ranged from 5 above the normal at The Dalles to 2 above at Roseburg. Ashland reports the highest maximum temperature, 69, on the 26th, and Fort Klamath the lowest minimum, on the 29th.

January was a very cold month, while February, however, was the reverse. The mean temperature of the state was 41.5.

Precipitation, including melted snow (in inches).—The precipitation was most markedly below the normal in all sections; the deficiency ranging from 6.85 at Bandon to 0.90 at Lakeview.

For the season from July 1st, 1887, to March 1st, 1888, the precipitation is below the normal in all sections except at Astoria, where it is 2.46 above the normal. The deficiency of the season ranges from 9.34 at Bandon to 1.60 at Eola. Comparatively speaking, the greatest deficiency in the seasonal precipitation is in extreme southern Oregon, where much deficiency can least be stood in the annual or seasonal precipitation. At Portland there is a deficiency in the seasonal precipitation of 18 per cent., at Bandon 20 per cent., at Eola 5 per cent., at Roseburg 10 per cent., at Ashland 36 per cent., and at Lakeview 46 per cent.

The "Pennsylvania State Weather Service," report prepared under the direction of the Franklin Institute, Philadelphia, by Sergeant T. F. Townsend, Signal Corps:

The mean temperature for February for the state was 28°.4, which is about 1° below the normal. Fayette, Alleghany, and Philadelphia report the highest monthly means, and Wayne, Sullivan, Warren, and Erie the lowest. The warmest period of the month prevailed on the 14th and 20th. Uniontown reports 63°; Pittsburg, 61°; Indiana, 61°; and Greensburg, 60°. The cold wave of the 10th was general throughout the state, and the following low temperatures were reported: Dyberry, -81°; Columbus, -25°; Blooming Grove, -22°; Tionesta, -19°; Bernice, -19°; Wysox, -18°.5; Philipsburg, -18°; Scranton, -17°; Eagle's Mere, -16°; and Clarion, -16°. In some localities the lowest temperatures noted occurred on the 16th.

The average precipitation, including rain and melted snow, was 2.50 inches, which is from a half to one inch below the normal. The total precipitation in eastern Pennsylvania was nearly double that in the western portion. Wellsborough reports 4.64 inches; West Chester, 4.97 inches; Quakertown, 4.26 inches; and Bernice, 4.46 inches, while Philipsburg had but 0.89 inch, and Washington, 0.91 inch.

The "South Carolina Weather Service," Hon. A. P. Butler, Com'r of Agriculture for South Carolina, Columbia, director:

The areas of low barometer which prevailed in the Southern States on the 8d, 4th, 18th, 21st, 22d, 23d, and 24th brought with them rain; from the 19th to the 24th were six days of threatening and rainy weather, during which the major part of the monthly precipitation occurred. A heavy rainfall was re-

ported on the 11th. Aside from these we had the average number of clear and fair days. Average rainfall for the month, 4.83 inches, exceeding the means of February, 1887, by nearly one and a half inches. The greatest amount of precipitation occurred in the northern counties.

The mean temperature of the state was 49°.9, 2°.7 lower than for the same month last year. The maximum temperature was observed at most of the stations throughout the state on the 18th and 20th, and the minimum temperature on the 28th.

The following is an extract from the report of the "Meteorological Department of the State (Tennessee) Board of Health," prepared under direction of J. D. Plunket, M. D., President of the State Board of Health, by H. C. Bate, Signal Corps, Assistant, Nashville:

The month of February was characterized by a large percentage of cloudiness, high winds, and disagreeable weather generally.

The mean temperature was 44°.5, slightly above the mean of the past five years. It was about 5° lower than the February mean of last year, but was 8° higher than that of 1886, and nearly 11° higher than that of 1885. The highest temperature was 71°, recorded at various stations on the 17th, 18th, and 19th, and was the lowest February maximum during the last five years except that of 1886, which was 70°. The lowest temperature was 4°, recorded on the 28th. With the exception of last year it was the highest February minimum during the past five years, the lowest during that time being in 1886, when the remarkable and perhaps unprecedented record of -22° was reported. The minimum reported last year was 20°, making a difference of 42° in the February minimums of the two years. The mean daily range was slightly less than the normal of five years.

The mean rainfall was 3.45 inches, nearly two inches less than the February mean of the past five years, the greatest during that period being 8.45 inches in 1884, and 8.03 inches last year, and the least, 2.39 inches in 1885. Of this amount the eastern division received an average of about four inches, the middle division about three and a half inches, and the western division about two and a half inches. The greatest monthly rainfall was 5.34 inches, reported at Andersonville, and the least was 1.90 inch, reported at Milan. The greatest rainfall in twenty-four consecutive hours was 2 inches, reported on the 9th at Postoria. The days of greatest rainfall were the 3d, 7th, 10th, 11th, 19th, and 24th, and of these the greatest fall occurred on the 19th. Most of the rains during the month were general, though comparatively light, only a few stations reporting over one inch of daily rainfall. On the 26th and 27th there were falls of sleet and snow; the greatest depth reported for the month was 3.62 inches, at Cookeville. Slight falls of snow and sleet were reported during the first decade at a few stations. Frosts were reported at various stations on nineteen days, the 3d, 4th, 5th, 7th, 8th, 19th, 20th, 23d, 24th, and 25th being the days on which none was reported. Most of these were heavy or killing.

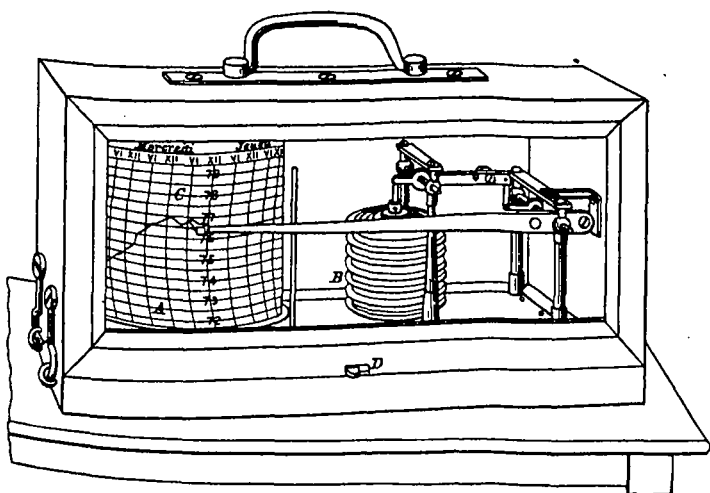
The feature of the month was the thunder-storm of the 19th, which prevailed with greater or less severity throughout the western and middle portions of the state and a small portion of the eastern division. It was quite severe in the northern portion of the western division, and the northwestern portion of the middle division, and extended into southwestern Kentucky, where it was very severe.

NOTES AND EXTRACTS.

The following descriptions of self-registering instruments are published in compliance with frequent requests for information concerning suitable instruments for making a continuous record of atmospheric pressure and temperature:

RICHARD'S SELF-REGISTERING BAROMETER.

Fig. 1.



The "Richard" self-registering aneroid barometer, shown in Fig. 1, consists of a cylinder, A, on which the recording paper is wound, revolving once a week by means of a clock-work contained inside; a series of metallic boxes, B, eight in number, screwed together and exhausted of air; a compound lever, by means of which the motion of top of metallic boxes is transmitted, magnified about forty times, to the marking pen, C.

The essential part of the barometer is the aneroid chamber or shell, made of two thin sheets of metal, soldered at the edges, and exhausted of air. The two thin sheets thus tending to approach by the atmospheric pressure are kept apart by the opposing action of a spring within, formed of two discs of steel in contact at their ends.

Each shell thus formed is flattened slightly when the external pressure increases and swells out when the pressure diminishes.

Each of the shells has a projecting piece on each base in the axis; the piece on one side is a screw, having a thread cut on it, the other is a nut. The shells are made into a vertical column by screwing the one on the other. The lower base of column being fixed, the upper end rises and falls with every variation in the atmospheric pressure, by a quantity which is the sum of the displacements of each elementary shell. As far as vacuum is concerned the shells are independent of each other.

The instrument is compensated for temperature. This is accomplished by leaving a sufficient quantity of air in one of the shells, ascertained by experiment when the instrument is made, so that with a rise of temperature the tendency of the barometer to register too low on account of the expansion of the levers and other parts is counteracted by the increased pressure of the air in the shell. The instrument, however, should be kept at a uniform temperature.

RICHARD'S SELF-REGISTERING THERMOMETER.

The "Richard" self-registering thermometer, shown in Fig. 2, has many parts similar to the self-registering aneroid. The essential or thermometric part is the copper bulb, A, filled with alcohol.